REMARKS

Claims 1-31 are pending in the application.

Claim Rejections

In the present office action, claims 1-9, 11-12, 15, 18-24, and 28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,896,211 (hereinafter "Watanabe"), in view of newly cited U.S. Patent No. 5,142,402 (hereinafter "Tsushima"). In addition, claims 10 and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Watanabe in view of Tsushima as applied to claims 1 and 18, and further in view of Hill et al. (U.S. Patent No. 5,546,190, hereinafter "Hill"). Applicant respectfully traverses these rejections and requests reconsideration in view of the following discussion.

Applicant submits that claims 1 and 18 recite features neither taught nor suggested by the cited art. For example, in the present Office Action on page 4, it is suggested that

> " Watanabe in view of Tsushima discloses:
> wherein signal extractor of one of the at least two heterodyne receivers comprises two extraction paths (Tsushima, e.g., Fig. 13, two paths) and a combiner (Tsushima, e.g., adder 4), each extraction path configured to process a different one of at least two sidebands within the electrical signal (Tsushima, e.g., col. 8, l. 56-60), wherein a first extraction path of the two extraction paths is configured to process only an upper (Tsushima, e.g., col. 8, l. 56-58) sideband within the electrical signal and a second extraction path of the two extraction paths is configure to process only a lower sideband (Tsushima, e.g., col. 8, l. 58-60) within the electrical signal."

However, Applicant submits that the cited art fails to disclose the recited features. Claim 1 recites a system comprising:

"...a receiver subsystem comprising:

an optical splitter for splitting a composite optical signal having at least two subbands of information and at least one tone into at least two optical signals; and

at least two heterodyne receivers, each heterodyne receiver coupled to receive one of the optical signals from the optical splitter for recovering information from one of the subbands contained in the optical signal, each heterodyne receiver comprising:

a heterodyne detector for mixing an optical local oscillator signal with the optical signal to produce an electrical signal which includes a frequency down-shifted version of the subband and the tone of the optical signal; and

a signal extractor coupled to the heterodyne detector for mixing the frequency down-shifted subband with the frequency down-shifted tone to produce a frequency component containing the information;

wherein a signal extractor of one of the at least two heterodyne receivers comprises two extraction paths and a combiner, each extraction path configured to process a different one of at least two sidebands within the electrical signal, wherein a first extraction path of the two extraction paths is configured to process only an upper sideband within the electrical signal and a second extraction path of the two extraction paths is configured to process only a lower sideband within the electrical signal."

It is noted that each of the recited heterodyne receivers recovers information from one of the subbands, each heterodyne receiver comprises a signal extractor, and one of the signal extractors comprises two extraction paths, each extraction path is configured to process a different sideband within the electrical signal. It is further noted that subbands and sidebands are different, and both are recited in the claim. Furthermore, one extraction path processes only an upper sideband and the other extraction path processes only a lower sideband.

In contrast, Tsushima merely discloses a receiver having two extraction paths, one for an upper subband and one for a lower subband. More specifically, Tsushima discloses

"A first embodiment of a polarization diversity optical receiving apparatus according to the present invention will now be described by referring to FIG. 1. An optical signal 1 is inputted to a heterodyne detector 2. In the

> heterodyne detector 2, an optical local signal 8 outputted from an optical local oscillator 7 such as a semiconductor laser is combined with the optical signal 1 by an optical coupler 9, the resultant combined optical signal 10 being thus outputted. By a polarization beam splitter 11, the combined optical signal is split into two polarization components 12x and 12y which are perpendicular to each other. The components 12x and 12y are inputted to optical detectors 13x and 13y comprising photodiodes and outputted as IF signals 14x and 14y. At this time, the optical local signal is divided nearly equally into 14x and 14y. Examples of spectra of 14x and 14y are shown in FIG. 2A and 2B. The IF signal 14y is inputted to a frequency converter 3A and outputted as an IF signal 15y shifted in intermediate frequency by f_c. In the frequency converter 3A, the IF signal 14y and a sine wave signal having a frequency f.sub.c outputted from an oscillator 16 are inputted to a frequency mixer 17. As a result, an IF signal obtained by up-converting the IF signal 14y by the frequency f_c and another IF signal obtained by down-converting the IF signal 14y by the frequency f_c are obtained as the output of the frequency mixer 17. A bandpass filter 18 extracts only either one of two IF signals outputted from the frequency mixer 17. If the down-converted signal is extracted by the bandpass filter, 3A acts as a frequency converter of down conversion. If the up-converted signal is extracted by the bandpass filter, 3A acts as a frequency converter of up conversion. If the frequency mixer is one of image rejection type, the filter 18 may be omitted in some cases. An example of the spectrum of the IF signal 15y outputted from the frequency converter is shown in FIG. 2C. The IF signals 14x and 15y are added together in an adder 4, a sum signal 19 being outputted. An example of spectra of the sum signal 19 is shown in FIG. 2D." (Tsushima, col. 4, line 34 to col. 5, line 4).

As may be seen from the above, sum signal 19 includes two IF subband signals such as 14x and 15y, one representing a first polarization component and the other a second polarization component. However, these two subband signals are not equivalent to sidebands, as recited. As noted above, subbands are different from sidebands. Further, the at least two sidebands, as recited, are processed by a signal extractor that is for recovering information from only one of the subbands. Therefore, the at least two sidebands are found within a single subband. No such sidebands are disclosed or suggested by Tsushima. Accordingly, Applicant finds no teaching or suggestion in Tsushima of "two extraction paths and a combiner, each extraction path configured to process a different one of at least two sidebands within the electrical signal, wherein a first extraction path of the two extraction paths is configured to process only an upper

sideband within the electrical signal and a second extraction path of the two extraction paths is configured to process only a lower sideband within the electrical signal," as recited. Nor are these features found in any combination of Tsushima with Watanabe and/or Hill.

For at least the above reasons, Applicant submits that claim 1 is patentably distinguishable from the cited art. As independent claim 18 recites limitations similar to those of claim 1, claim 18 is believed patentably distinguishable from the cited art for similar reasons. Likewise, each of dependent claims 2-17 and 19-31 is believed patentably distinguishable from the cited art for at least the above reasons as well.

In addition to the above patentably distinguishing features, the claims are further patentably distinguishable. On page 3 of the present Office Action, it is stated:

> "Watanabe does not expressly disclose :
>
> said signal extractor coupled to the heterodyne detector for mixing the frequency down-shifted subband with the frequency down-shifted tone to produce a frequency component containing the information;
>
> wherein a signal extractor of one of the at least two heterodyne receivers comprises two extraction paths and a combiner, each extraction path configured to process a different one of at least two sidebands within the electrical signal, wherein a first extraction path of the two extraction paths is configured to process only an upper sideband within the electrical signal and a second extraction path of the two extraction paths is configured to process only a lower sideband within the electrical signal.
>
> However, this mixing is a common demodulation technique used in coherent detection systems to extract an information signal from heterodyne-detected signals. Tsushima teaches such mixing as part of a heterodyne detection device (Tsushima, e.g., note the squaring circuit in the demodulator of Fig. 4B as part of the device in Fig. 13).

However, Applicant submits that Tsushima does not teach or suggest mixing, as recited. It is noted regarding claim 1, that the recited signal extractor mixes a frequency down-shifted subband of the at least two subbands with the frequency down-shifted tone and that the tone is part of the composite optical signal. In contrast, Tsushima discloses a

receiver that mixes two IF signals produced by a divider rather than mixing an IF signal with a tone of the optical signal. More specifically, Tsushima discloses:

> "In FIG. 4B, the square detector is implemented by dividing the sum signal 19 in a divider 20, providing two signals resulting from the division with nearly equal delay times, inputting the two signals thus provided with delays to a frequency mixer 17, and extracting a baseband signal alone out of the output of 17 in a lowpass filter 21. " (Tsushima, col. 5, lines 22-28).

It is noted that sum signal 19 (see Tsushima, Figure 2D) contains two subbands but not a tone. Frequency mixer 17 receives as inputs two signals from the spectrum of signal 19, each corresponding to one of the two subbands. Therefore, neither of the two signals is equivalent to a tone, as recited. Accordingly, Applicant finds no teaching or suggestion in Tsushima of "a signal extractor coupled to the heterodyne detector for mixing the frequency down-shifted subband with the frequency down-shifted tone to produce a frequency component containing the information," as is recited in claim 1. Nor are these features found in Hill. Hill discloses a pilot tone that is used within the receiver for carrier and clock recovery. However, Hill does not disclose mixing the pilot tone with a frequency down-shifted subband to produce a frequency component containing the transmitted information. Instead, Hill's pilot tone is used to recover a clock that is in turn used to generate subcarrier frequencies for demodulation of the received signals.

For at least these additional reasons, Applicant submits that claim 1 is patentably distinguishable from the cited art. As independent claim 18 recites limitations similar to those of claim 1, claim 18 is believed patentably distinguishable from the cited art for similar reasons. Likewise, each of dependent claims 2-17 and 19-31 is believed patentably distinguishable from the cited art for at least the above reasons as well.

In addition to the above, Applicant submits the dependent claims recite additional features neither disclosed nor suggested by the cited art. For example, claim 9 recites "wherein the tone for each optical signal is located at an optical carrier frequency for the corresponding subband." However, since Tsushima merely discloses mixing of two subbands rather than mixing a subband and a tone, Tsushima fails to disclose the tone as

recited. Nor are these features found in any combination of Tsushima with Watanabe and/or Hill. Also, claim 11 recites "wherein the upper sideband and the lower sideband are sidebands of a common pilot tone." Since, as noted above, the cited art fails to disclose or suggest processing of sidebands as recited, the cited art also fails to disclose the upper sideband and the lower sideband are sidebands of a common pilot tone.

Accordingly, Applicant submits that claims 9 and 11 are patentably distinguishable from the cited art for at least these additional reasons as well. As claims 24 and 19 recite limitations similar to those of claims 9 and 11 respectively, claims 24 and 19 are believed patentably distinguishable from the cited art for similar reasons.

In the present office action, claims 13-14, 16-17, 26-27, and 29-30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Watanabe in view of Tsushima as applied to claims 1, 15, 18, and 28 and further in view of Wong et al. (U.S. Patent No. 6,058,227). Also, claim 31 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Watanabe in view of Tsushima as applied to claim 28 and further in view of Ellis et al. ("Feedback control of a linearised Mach-Zehnder modulator for SCM applications", and Sargis et al. (U.S. Patent No. 5,596,436). In view of the above remarks, Applicant submits further traversal of these rejections is unnecessary at this time.

CONCLUSION

Applicant submits the application is in condition for allowance, and an early notice to that effect is requested.

If any fees are due, the Commissioner is authorized to charge said fees to Meyertons, Hood, Kivlin, Kowert, & Goetzel, P.C. Deposit Account No. 501505/5957-41701/RDR.

Respectfully submitted,

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